in successive years." Even for the same stream floods are a local phenomenon. An example of this is the record for Cincinnati and Pittsburgh, both on the Ohio River: the ten greatest floods are arranged in order of their magnitudes for the two stations (many other stations are tabulated in the paper), with the following result:

Station	Order of Magnitude									
	1	2	3	4	5	6	7	8	9	10
Cincinnati	1884	1913	1883	1907	1918	1898	1897	1901	1890	1882
Pittsburgh	1907	1884	1902	1913	1891	1861	1908	1862	1904	1897

Of the European rivers, the Danube, the Seine, the Neckar, the Rhine and the Main are investigated. The records of floods in these rivers extend back many centuries and would provide ample data for any periodic recurrence, but these also are found to be dependent upon the nature of the watershed and the rainfall distribution. The conclusions derived from the paper are:

1. The records of both American and European rivers show an average of 7 to 10 great floods per century.

2. Great floods are primarily due to precipitation, and that precipitation, in the form of rain, which produces floods may be of two distinct types, (*a*) so intense and widely distributed as to produce flooding regardless of antecedent conditions; (*b*) moderate rains continued intermittently for eight to ten days or more with antecedent conditions favorable to high run-off.

3. There does not appear to be an orderly progression in the magnitude of floods with the lapse of years; that is to say, the absolute maximum flood of any 100-year period is not necessarily greater than the absolute maximum flood for the preceding 100 years.

4. The magnitude of great floods with respect to the average annual flood, seems to increase in geometrical progression but apparently wholly regardless of the flow of time.

5. Great floods like great rainfalls are essentially a local phenomenon even for the same stream.

This paper was discussed by Mr. Robert E. Horton,[5] the hydrologic engineer, who is of the opinion that the occurrence of maximum floods is fortuitous and that the combinations of causes which may cause a maximum flood are very much more limited than the number of combinations which may cause ordinary floods.

NOTES

The spring announcement of MacMillan books contains the notice of a text-book on "Agricultural Meteorology," by Professor J. Warren Smith, of the United States Weather Bureau. This is the first text-book exclusively devoted to this subject and is certain to find a large demand, not only from agricultural colleges and universities, but also from the farmer and general reader, to whom it will be of practical value.

In the October, 1919, *Monthly Weather Review*, there are several short articles and abstracts on forecasting from local signs, such wind direction, clouds, pressure change, clouds, sky colors, and the scintillation of the stars. It is interesting to note the difference in character of the forecasting problems in Europe, where data is incomplete from the west, and in America, where more data is available but a greater diversity of local problems is encountered.

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SPECIAL ARTICLES

A SIMPLE METHOD FOR TITRATING ELECTROMETRICALLY TO A DESIRED END POINT IN ACID-ALKALINE REACTIONS

Sörensen[1] and Clark and Lubs[2] have published detailed directions for the preparation

[1] Sörensen, "Über die Messung und Bedeutung der Wasserstoffionenkonzentration bei biologischen Prozessen," *Ergebnisse d. Physiologie*, 12, 393, 1912.

[2] Clark and Lubs, "The colorimetric determination of hydrogen ion concentration and its application in bacteriology," *Jour. Bacteriology*, 2, pp. 1, 109, 191, 1917.

[5] *Ibid.*, pp. 866–867.

of "standard mixtures" having a known hydrogen ion concentration or p_H value. These investigators established their formulas very precisely by the use of a potentiometer method employing a hydrogen electrode. According to Clark,[3] the p^H values in the freshly prepared mixtures may be considered reliable to a few hundredths of a p_H unit. Probably the widest application of these standard solutions is, in connection with color indicators, for comparisons with solutions having an unknown hydrogen ion concentration.

The fact that standard mixtures can readily be prepared, combined with the further fact that the hydrogen electrode is an appliance which is simple and convenient to use, leads to a very obvious suggestion. This is to utilize the hydrogen electrode as a means for comparison of an unknown with a standard solution. It should extend materially the usefulness of the standard solutions to which reference has been made.

We may suppose that we desire to titrate a solution of unknown p^H value to a definite hydrogen ion concentration. From the curves of Sörensen's article, or from the formulas of Clark and Lubs, we select the particular solution having a p_H value which corresponds to the point to which we desire to titrate. This solution is placed in one vessel with a hydrogen electrode, and connection is established between the standard solution and the unknown, in a second vessel, by means of a salt bridge of saturated potassium chloride, so that concentration potentials may be eliminated.[4] Another hydrogen electrode is placed in the solution of unknown concentration, and the two electrodes are connected through a tapping key and a galvanometer of high resistance. Appropriate protective resistance may also be put in this circuit. The process of titrating to the desired end point then consists merely of adding the titrating solution until, upon tapping the key, no deflection of the galvanometer is observed. The inference is that zero potential difference between the hydrogen electrodes is an indication of equal hydrogen ion concentrations of the two solutions. The supposition may be verified by putting both electrodes into one or the other of the solutions and noting whether the galvanometer deflection remains zero.

It may be pointed out that such a titration can be carried out in any solution in which a hydrogen electrode will maintain its equilibrium, regardless of color, turbidity, or other experimental conditions. The electrolytic portion of the galvanometer circuit will, in most cases, have a low resistance, which insures the desirable condition for sensitiveness of response of the instrument. The method has most of the advantages of the potentiometer method over the colorimetric methods, with the obvious exception that it can be used only for titrating and that the titration can be carried only to the end point which is determined by the standard solution. With the potentiometer it is possible, of course, not only to titrate to any end point but also to make a direct measurement, without titration, of the p^H value, whatever this may be.

It should be noted, finally, that in the titration described no calomel electrode is used, and that the accuracy with which the titration may be made is limited only by the accuracy with which the p_H value of the standard solution is known.

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[3] Private communication.

[4] The suggestion of using an agar-agar salt bridge to minimize diffusion effects (Falles and Vosburgh, *J. A. C. S.*, 40, 1306, 1918) seems a good one.

THE AMERICAN SOCIETY OF MAMMALOGISTS

THE second annual meeting of the American Society of Mammalogists was held May 3–5, 1920, in the American Museum of Natural History, New York City. Officers for the coming year are Dr. C. Hart Merriam, president; Mr. E. W. Nelson and Dr. Wilfred H. Osgood, vice-presidents; Dr. H. H. Lane, recording secretary; Dr. Hartley H. T. Jackson, corresponding secretary; Mr. J. W. Gidley, treasurer; Mr. N. Hollister, editor; Dr. Glover M. Allen, Dr. R. M. Anderson, Dr. Joseph Grinnell,